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If more generally

$$(34') \quad X = a_1 x_1 + a_2 x_2 + \dots + a_m x_m = [a x],$$

where $x_1 = a_1 \pm r_1, x_2 = a_2 \pm r_2, \dots, x_m = a_m \pm r_m$,
then we have by composition

$$(40') \quad \varphi(X) = \frac{\rho dX}{\sqrt{([a^2 r^2] \pi)}} e^{-\frac{\rho^2}{[a^2 r^2]} (X - [a a])^2},$$

$$(43') \quad X = [a a] \pm \sqrt{[a^2 r^2]}.$$

If

$$(34'') \quad X = f(x_1, x_2, \dots, x_m)$$

the above integration cannot be effected but an approximate solution can be given in that case which is the nearer perfect the smaller the probable errors r_1, r_2, \dots, r_m . We have by Taylor's theorem, neglecting higher powers of increments $\triangle x_1, \triangle x_2, \dots, \triangle x_m$

$$(34''') \quad X = f(a_1, a_2, \dots, a_m) + f'(a_1) \triangle x_1 + f'(a_2) \triangle x_2 + \dots + f'(a_m) \triangle x_m.$$

Within the range of $\triangle x_1, \triangle x_2, \dots, \triangle x_m$, for which this form is exact enough, X is of the form (34'). In the integration however these increments have to pass from $+\infty$ to $-\infty$. If the probable errors are small this will make no sensible difference since the integral

$$\int_{-\infty}^{\infty} \frac{\rho d\triangle}{\triangle r \sqrt{\pi}} e^{-\frac{\rho^2}{r^2} \triangle^2}$$

approaches 0 the more rapidly the smaller r . This circumstance admits to a certain extent the treating of X as a linear function of $\triangle x_1, \triangle x_2, \dots, \triangle x_m$ and we have

$$(40'') \quad \varphi(X) = \frac{\rho dX}{\sqrt{[f'(a)^2 r^2] \pi}} e^{-\frac{\rho^2}{[f'(a)^2 r^2]} [X - f'(a_1, a_2, \dots)]^2}$$

$$(43'') \quad X = f(a_1, a_2, \dots, a_m) \pm \sqrt{[f'(a)^2 r^2]}.$$

(To be continued.)

NOTE BY S. W. SALMON.—In the note on Differential Calculus (p. 14), I wrote $\left(\frac{y-u'}{u-u'}\right)_{x=x'} = 1$. This needs to be proved. If the rate of motion of the point B is increasing, just before $x = x'$, $\left(\frac{y-u'}{u-u'}\right)$ is greater than 1, and just after $x = x'$, it is less than 1; therefore when $x = x'$, $\left(\frac{y-u'}{u-u'}\right) = 1$. If B 's rate is decreasing, it may be proved in a similar manner that $\left(\frac{y-u'}{u-u'}\right)_{x=x'} = 1$.